James River – Richmond and Tributaries Bacteria TMDL Implementation Plan Overview



DEQ Central Office
Richmond, VA
May 18, 2011

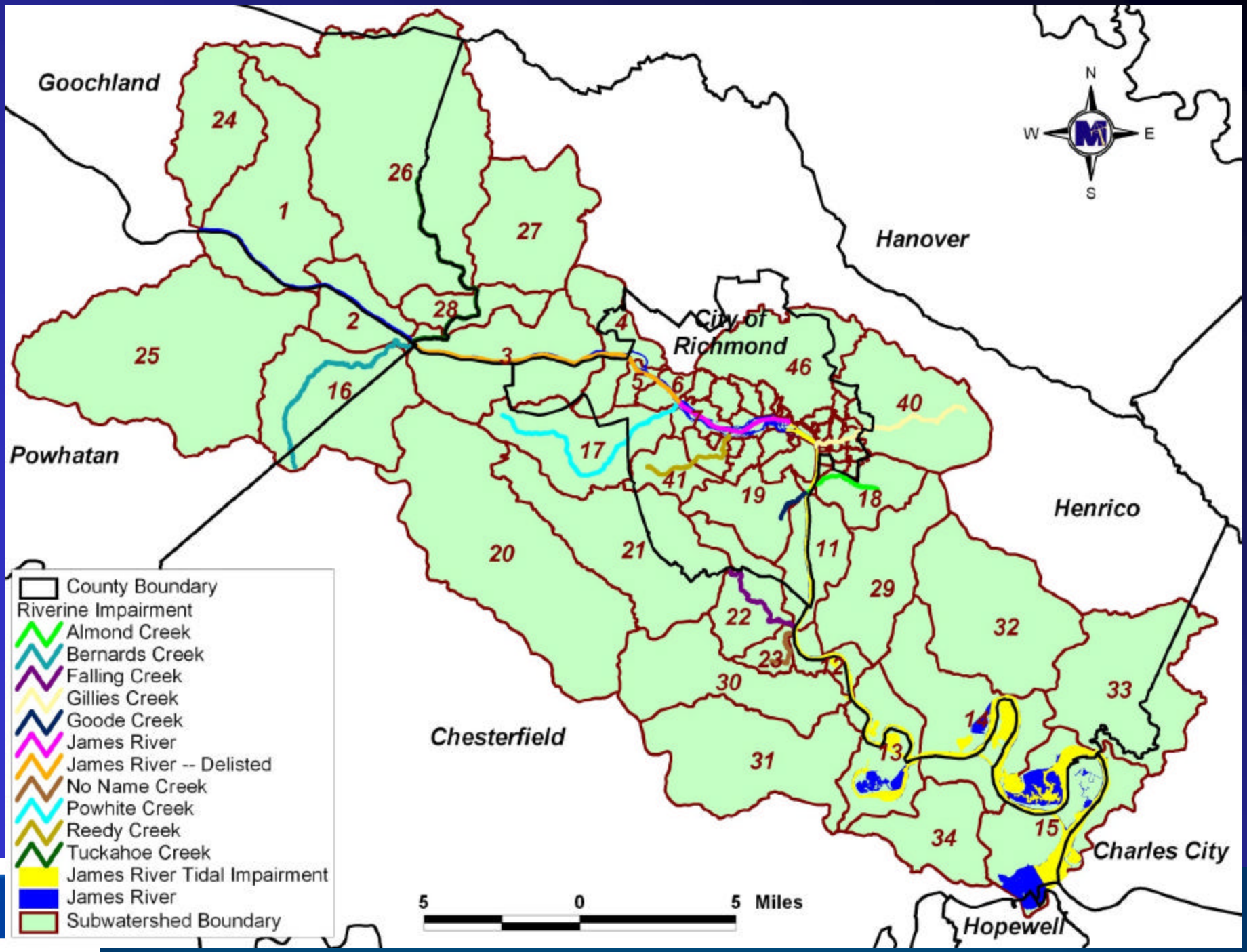
Acknowledgements

- Steering committee and working group members
- Residents in the James River - Richmond watershed
- Powhatan, Goochland, Henrico, Chesterfield Counties
- City of Richmond
- Soil and Water Conservation Districts
- Alliance for the Chesapeake Bay, Riverkeepers, Roundtables, Sierra Club, Reedy Creek Coalition
- VA Department of Health
- VA Department of Conservation and Recreation
- VA Department of Environmental Quality
- VA Department of Game and Inland Fisheries

Thank you for all of your assistance and input throughout this process!

Primary Contact Bacteria Impairments in the Plan

- **James River (riverine)**
  - (VAP-H39R-08) Boulevard Bridge to Mayos Bridge (2.99 mi)
- **James River (tidal)**
  - (VAP-G01E-01) fall line at Mayos Bridge to the Appomattox River (10.84 sq. mi)
- **Almond Creek**
  - (VAP-G01R-02) headwaters to the JR (2.26 mi)
- **Bernards Creek**
  - (VAP-H39R-10) headwaters to the JR (8.23 mi)
- **Falling Creek**
  - (VAP-G01R-03) the Falling Creek Reservoir Dam to the JR (3.81 mi)
- **Gillie Creek**
  - (VAP-G01R-06) headwaters to the JR (5.79 mi)
- **No Name Creek**
  - (VAP-G01-R08) headwaters to the JR (1.84 mi)
- **Reedy Creek**
  - (VAP-H39R-06) headwaters to the JR (3.68 mi)
- **Tuckahoe Creek and tribs**
  - (VAP-H39R-02) conf. with Little Tuckahoe Ck to the JR plus tribs (30.2 mi total)
- **Powhite Creek**
  - (VAP-H39R-05) headwaters to the JR (8.12 mi)
- **Goode Creek**
  - (VAP-G01R-01) conf. with Broad Rock Ck to the JR (1.25 mi)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County Boundary
Riverine Impairment
Almond Creek
Bernards Creek
Falling Creek
Gillies Creek
Goode Creek
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Reedy Creek
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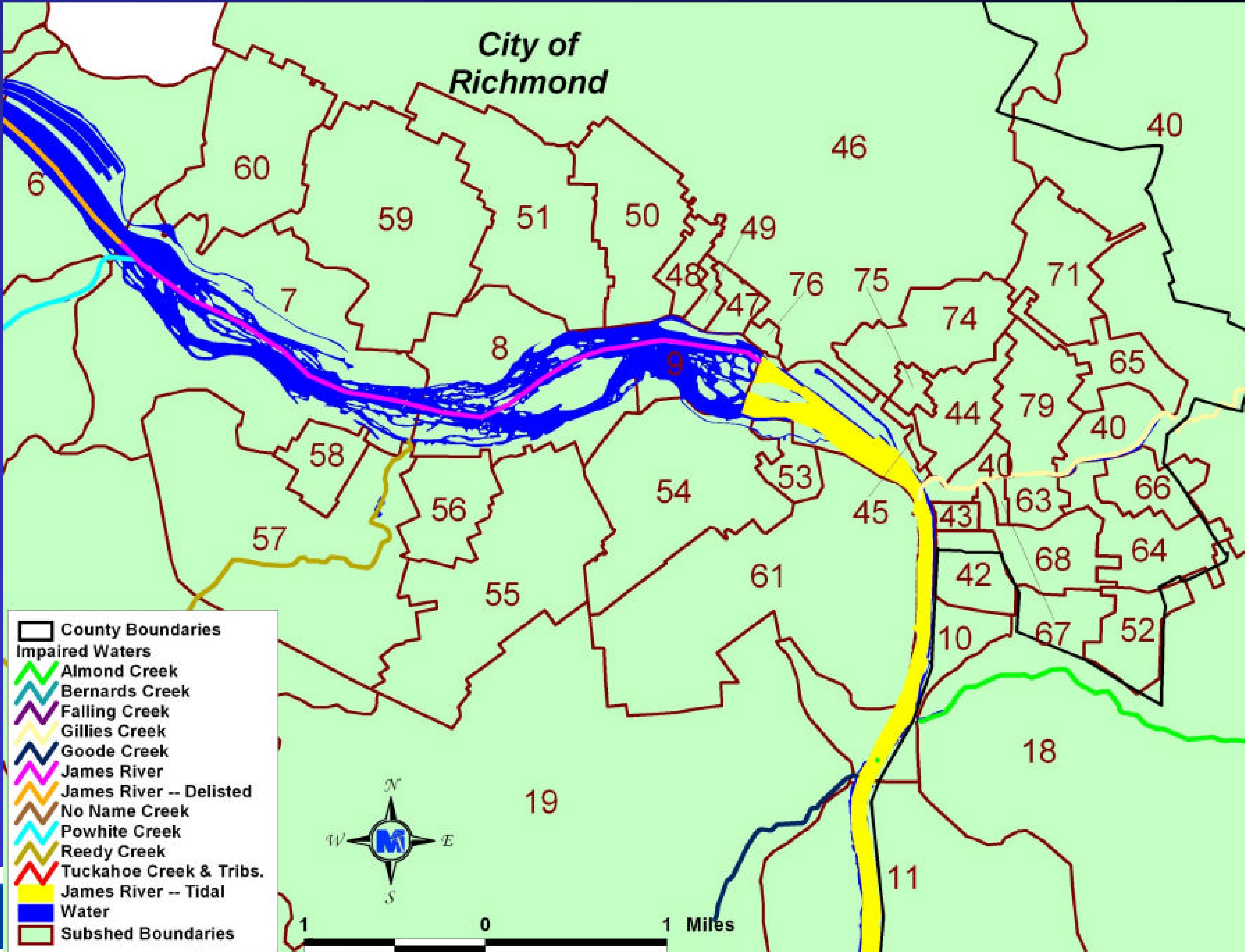
City of Richmond
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S
County Boundaries
Impaired Waters
Almond Creek
Bernards Creek
Falling Creek
Gillies Creek
Goode Creek
James River
James River -- Delisted
No Name Creek
Powhite Creek
Reedy Creek
Tuckahoe Creek & Tribs.
James River -- Tidal
Water
Subshed Boundaries
1
0
1 Miles

Why do we need to improve water quality?

- The James River and Tributaries do not meet water quality standards for bacteria (2010 303(d) lists)
- Total Maximum Daily Load (TMDL) studies developed in 2004 and 2010.
  - Identified the sources of bacteria in the streams and the reductions needed

Why should you participate?

- Economic benefits
  - Agricultural producers
  - Homeowners
  - Local economy
- Water quality benefits
  - Environmental
  - Human health

Review of the TMDL

% Reduction in Fecal Bacteria Loading From Existing Conditions

Includes the remodeling for Reedy Creek

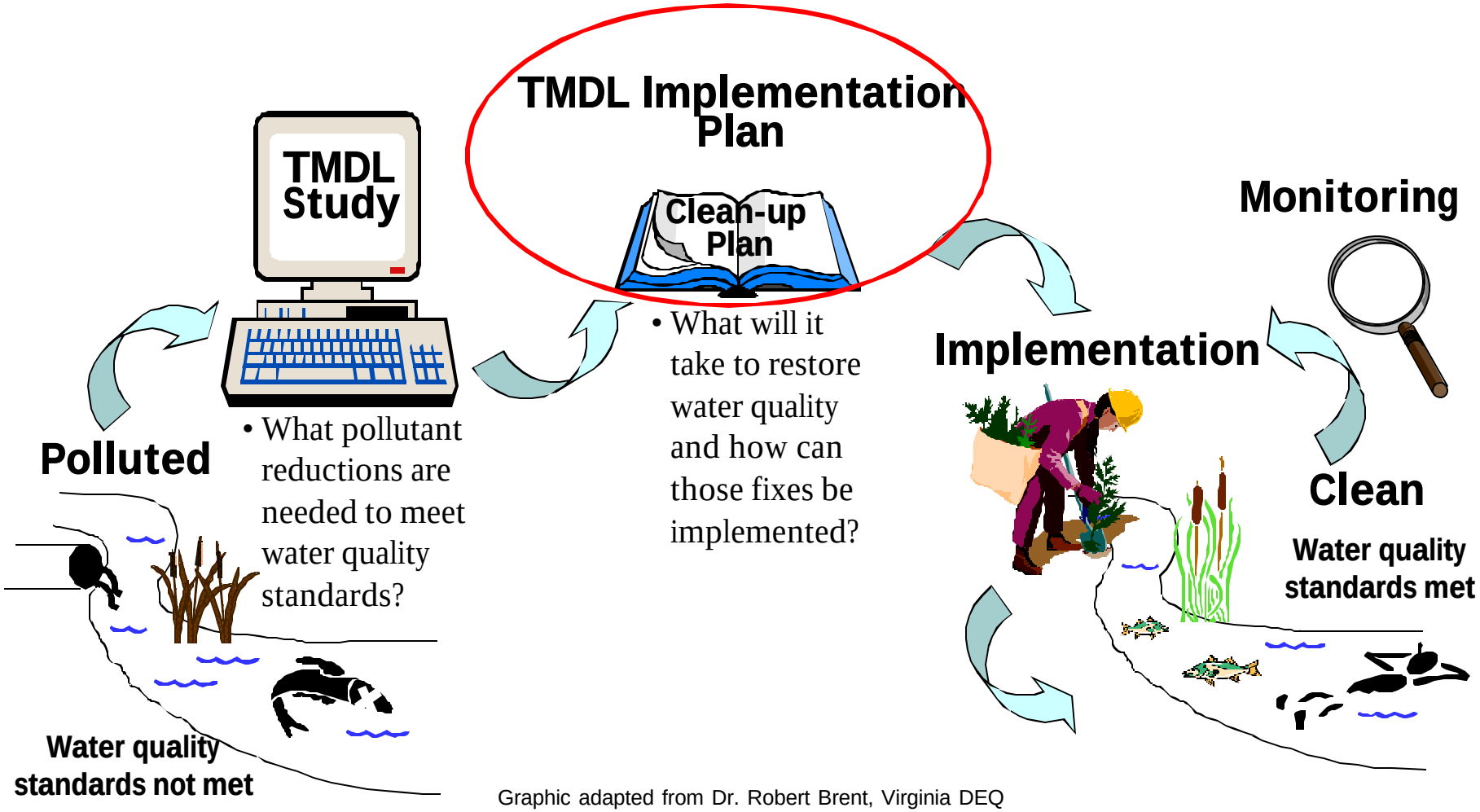
Impairment	Wildlife Direct	Wildlife NPS	Livestock Direct	Ag NPS	Human Direct	Res NPS	COR's CSO Plan
Almond Creek	0%	0%	**91%**	0%	**100%**	**85%**	**Alt E and 52% reduction**
Bernards Creek	0%	38%	**99%**	**93%**	**100%**	**96%**	NA
Falling Creek	0%	0%	0%	0%	**100%**	**13%**	NA
Gillie Creek	0%	0%	0%	0%	**100%**	**94%**	**Alt E and 95% reduction**
Goode Creek	0%	0%	0%	0%	**100%**	**96%**	NA
No Name Creek	0%	0%	0%	0%	**100%**	**94.50%**	NA
Powhite Creek	0%	0%	**40%**	0%	**100%**	**86%**	NA
Reedy Creek	0%	97%	0%	0%	**100%**	**99.50%**	NA
James River (riverine)	0%	63%	**96%**	**99%**	**100%**	**99%**	**Alternative E**
James River (tidal)	0%	0%	0%	0%	**100%**	0%	**Alternative E**
Stream	**Wildlife**		**Livestock**		**Human**	**Pet**	
Tuckahoe Creek	88.91%		**99%**		**99%**	**99%**	

- Tuckahoe Creek TMDL calculated using load-duration approach and BST data; other TMDLs calculated with HSPF model.
- COR's CSO Plan = The City of Richmond's Combined Sewer Overflow Long Term Control Plan (LTCP) "Alternative E" was the approved option within the LTCP based on cost analysis/effectiveness
- NPS = Non-Point Source Pollution

Review of the TMDL

- Failing septic systems, straight pipes, sewer overflows must be corrected
- Owners must pick up after their pets
- Livestock must be excluded from the streams
- Bacteria running off the land during rain events must be reduced, trapped, and/or filtered before entering the stream
- CSO bacteria loads must be reduced further than Alt E in Gillie and Almond Creeks

Overview of TMDL Process



Graphic adapted from Dr. Robert Brent, Virginia DEQ

TMDL Implementation Plan Development

- TMDL study tells us what is needed, TMDL Implementation Plan recommends how to get there
- Outlines recommended actions to improve water quality
- Serves as a guide for implementation efforts

Public Participation

- Kicked off the planning process in Nov w/ Public Meeting
- Working group meetings -
  - Agricultural - Nov, Dec, Jan
  - Residential - Nov, Dec, Jan
  - Government/Urban - Nov, Dec, Jan
- Steering committee - Jan, Mar, Apr

- Meeting minutes at & 1st Public Comment/Responses at: http://www.deq.virginia.gov/tmdl/ipproj.html
- Final public meeting (May 18th) and comment period -
  - Public comments will be accepted May 19 through June 20
- Finalization of the draft plan for State Water Control Board review

Best Management Practices (BMPs) already Installed!

- Streamside Livestock Fencing ~3.4 miles
- Reforestation of Erodible Crop/Pasture ~8 acres
- Cover Crops ~42 acres
- Ag Riparian Forest Buffer ~53 acres
- Prescribed Grazing Plan and Implementation ~2,783 acres
- Failing Septic System Corrections ~1,272 homes
- Dog Waste Pick-up Stations ~28
- Res Riparian Buffer ~3,700 ft
- Street Sweeping ~29,305 lane miles
- Biorention Basins ~46,060 sq ft
- Vegetated Roofs ~63,677 sq ft
- Rainwater Harvesting ~27,070 gallons
- Rain Gardens/Bayscapes ~92,753 sq ft
- Permeable Pavement ~177,306 sq ft

BMPs = Methods which are effective and practical in order to achieve an objective (such as preventing or minimizing pollution) while making the optimum use of resources

What BMPs are in the plan?

Stage I (1st 10-years):

What Best Management Practices (BMPs) are recommended for implementation first?

Stage I includes BMPs that are the biggest Bang-for-the-Buck, the easiest to implement and most cost-effective

Assessment of Needs

- Identification of best management practices (BMP) to reduce bacteria
  - Agricultural
  - Residential
  - Urban
- Technical assistance needed for implementation of the plan (staffing needs)

Agricultural BMPs Recommended

- ~35 miles of Streamside Livestock Fencing
  - 100% direct load efficiency; 100% buffer efficiency, 50% upland efficiency
- 855 acres Reforestation of Erodible Crop / Pasture (FR-1)
  - 99% land use conversion
- Increase Conservation Tillage
  - 61% land use efficiency
- 200 ac of Riparian Buffer on Cropland
  - 100% buffer efficiency, 50% upland efficiency
- 2,783 acres Prescribed Grazing Plan and Implementation (NRCS 528)
  - 50% land use efficiency

Livestock Exclusion Practices

The Livestock Exclusion with Riparian Buffer (LE-1T) systems include streamside fencing, interior fencing, alternative watering system, and requires a 35-ft buffer from the stream with a maximum of 85% cost share in an IP watershed. (100% direct load efficiency; 100% buffer efficiency, 50% upland efficiency)

The Livestock Exclusion with Reduced Set-Back (LE-2T) system is similar to the LE-1T, except it only requires a 10-ft buffer and offers a maximum of 50% cost-share, and can only be installed in a TMDL IP watershed. (100% direct load efficiency; 100% buffer efficiency, 50% upland efficiency)

What does a livestock exclusion system cost?

Average local system length 1,243 ft

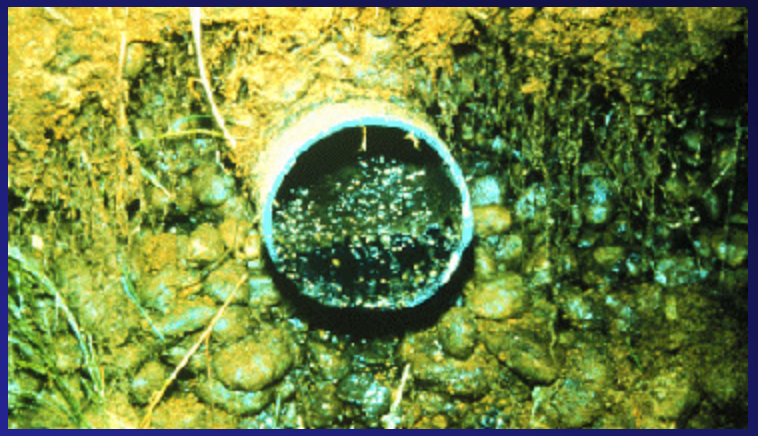
- Exclusion fencing, alternative water and cross fencing = $25,000
- Exclusion fencing and hardened crossing = $8,000

Pathway to Ag BMPs

- Identify the issue you would like to address on your property
- Contact your local SWCD
  - Henrico County Residents – Henrciopolis SWCD
    - 804-501-5175
    - www.co.henrico.va.us/departments/manager/boards---commissions/henricopolis/
  - Chesterfield County Residents – James River SWCD
    - 804-957-6165
    - www.jrswcd.vi.viringia.gov
  - Powhatan County and Goochland County Residents – Monacan SWCD
    - 804-556-4936

Residential/Urban Best Management Practices Recommended

- 217 straight pipe corrections and 750 failing septic system corrections
  - 100% source load efficiency
  - 206 Septic Repairs
  - 482 Septic Replacements
  - 118 Alternative Systems
  - 100 Sewer Connections (estimates provided by Chesterfield Co for their streams)
  - 5,543 Septic Tank Pump-outs (in Non Bay Act Localities – Goochland & Powhatan)



- Community Pet Waste Pick-up Education Program
  - 25% source load efficiency
  - 56 Dog Waste Pick-Up Stations
  - 161,000 Educational Mailings
  - 3 million Dog Waste Bag Refills

What does fixing/maintaining a septic system cost?

Septic System Pump-out = $450

Install standard septic system = $8,000

Install alternative system = $20,000

Repair failing septic system = $3,500

Connect to the sewer system = $6,000

Values estimated by the residential working group with exception of sewer system connection estimated by Chesterfield Co

Pathway to a Functioning Waste Treatment System

- Identify what kind of system you have:
  - Sewer – you have a monthly bill
  - Septic System – you have a drainfield
  - Straight pipe
    - Pipe with cloudy liquid discharging to stream? Deposits below pipe?
- Is your drainfield functioning properly?
  - Wet or mushy area above drain field?
  - Surfacing water is dark colored?
  - Grass greener in area near drainfield?

- If so, contact your local VDH
  - Henrico Co: 804-501-5846
  - Chesterfield Co: 804-748-1691
  - Powhatan Co: 804-598-5680
  - Goochland Co: 804-556-5343
- Or contact COR Department of Utilities: 804-644-3000
- Or contact Richmond HD: 804-205-3912
- VDH/DPU will then work with the homeowner to address the issue

Stage I: How much will the first ten years (Stage I) cost?

Agricultural BMPs = $ 4.16 M

Residential Waste BMPs = $ 10.01 M

Pet Waste Pick-up Program = $ 0.38 M

TOTAL = $ 14.55 M

Approximately 1.4 million annually

Bernards Creek
Photo by Mr. David Bernard

What BMPs are in the plan?

Stage II (2nd 10-years):

What practices will be implemented next if needed?

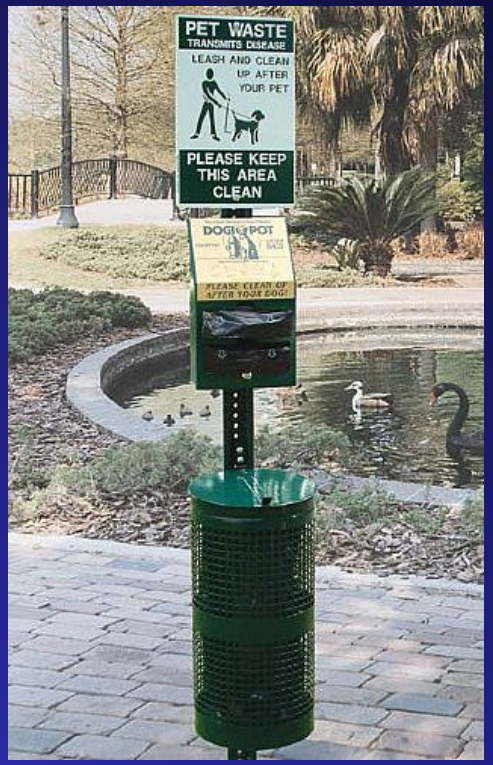
Need based on evaluation by Steering Committee of BMP installation progress and water quality monitoring results

Recommended Agricultural BMPs

- Streamside Fence Maintenance
  - 100% direct load efficiency; 100% buffer efficiency, 50% upland efficiency
- Winter Feeding Facility (WP-4D) for Beef Cattle
  - 85% source load efficiency
- Waste Storage for Horse Manure
  - 85% source load efficiency

Recommended Residential BMPs

- Continue Septic System Maintenance
- Continue Pet Waste Education Program and Proper Disposal
- Sewer Connections
  - of homes with failing septic systems in Chesterfield Co
  - 100% direct load efficiency
- Pet Waste Composters
  - 99% source load efficiency



Recommended Residential & Urban BMPs

- Wet Ponds Level 1 Design
  - 70% land use efficiency
- Rain Gardens Level 1 Design
  - 70% land use efficiency
- Bioretention Facilities Level 1 Design
  - 90% land use efficiency
- Infiltration Trench Level 1 Design
  - 90% land use efficiency


Raingarden

Recommended CSO SW Volume Reduction BMPs

- Retro-fitted Vegetated Roofs Level 2 Design
  - Captures 1 in rainfall; evapotranspiration
- Rainwater Harvesting - Rain Barrels
  - Captures 50 gallons; drains completely each day; 90% efficiency in runoff captured
- Rainwater Harvesting - Cisterns
  - Captures 500 gallons; drains completely each day; 90% efficiency in runoff captured
- Permeable Pavement Level 2 Design
  - Captures 1 in rainfall available each day
- Increased Storage within the CSO System
  - Based on City of Richmond's estimates

Stage II: If needed…

- If the practices outlined in Stage I are not enough, additional practices would be recommended:

2nd 10-years

Agricultural BMPs	$ 0.99 M
Residential Waste Treatment BMPs	$ 0.42 M
Pet Waste Pick-up Program	$ 0.37 M
Residential SW BMPs	$ 454.60 M
Urban SW BMPs	$ 412.82 M
TOTAL	**$ 869.20 M**

Approximate average of $87M per year during Stage II

Funding Potential

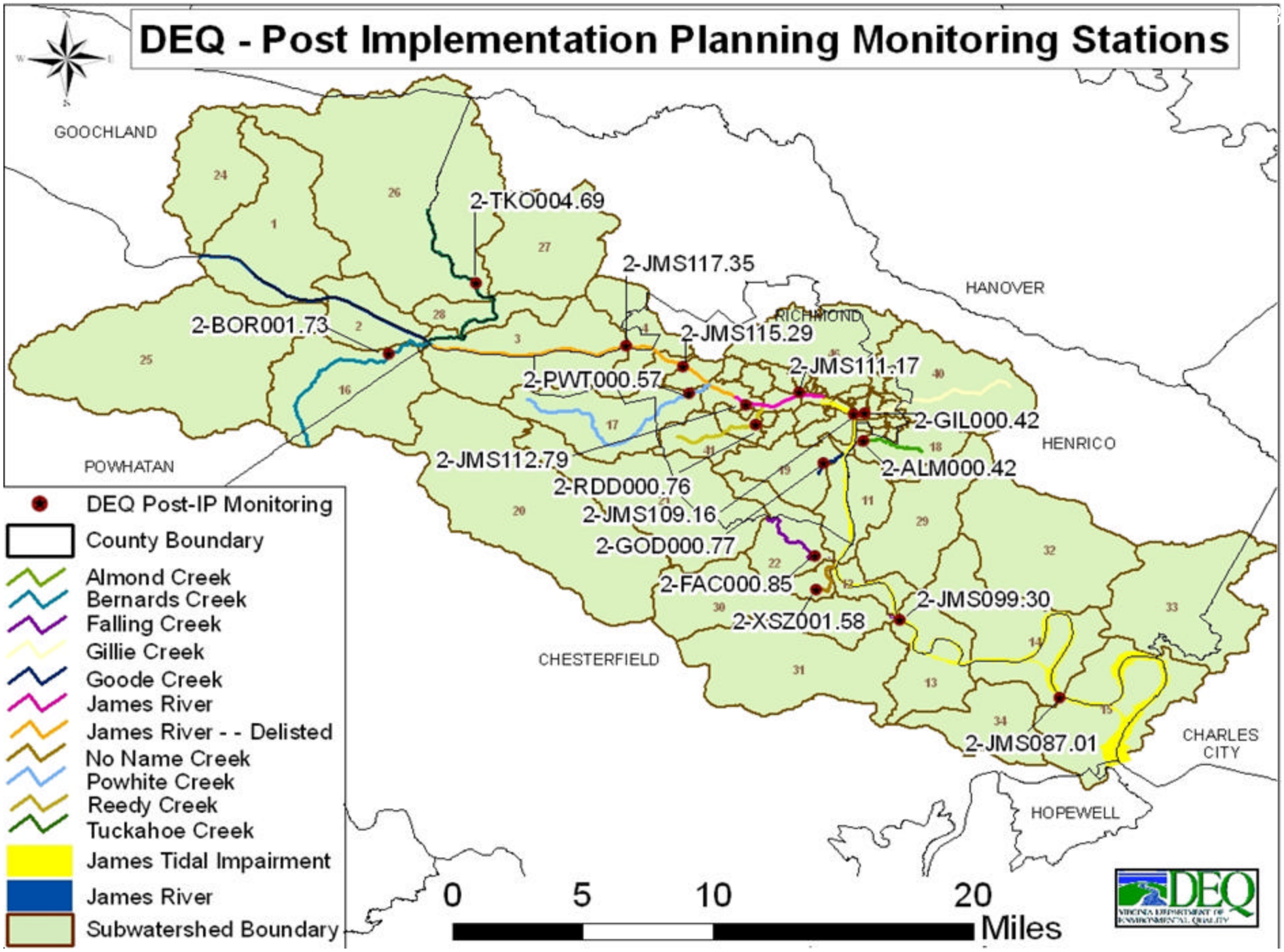
- **Federal Funds**
  - Federal Clean Water Act 319 Incremental Funds
  - Community Development Block Grant Program
  - Conservation Reserve Program (CRP)
  - Conservation Reserve Enhancement Program (CREP)
  - Environmental Quality Incentives Program (EQIP)
  - Wildlife Habitat Incentive Program (WHIP)
  - Wetland Reserve Program (WRP)
  - EPA Environmental Education Grants
- **Local Funds**
  - Counties/City of Richmond (CSO Program and MS4 permit compliance)
  - Indoor Plumbing Rehabilitation program
- **State Funds**
  - Clean Water Revolving Loan Fund
  - VA Agricultural (Ag) Best Management Practices (BMPs) Cost-Share Program
  - VA Ag BMPs Tax Credit Program
  - VA Ag BMPs Loan Program
  - VA Small Business Environmental Assistance Fund Loan Program
  - VA Water Quality Improvement Fund
- **Private Funds**
  - Chesapeake Bay Stewardship Fund
  - Southeast Rural Community Assistance Project (SE/R-CAP)
  - National Fish and Wildlife Foundation
  - Virginia Environmental Endowment Fund
- **Others as Identified**

Education and Outreach Ideas

- Pet waste stations with signs reminding pet owners to pick-up after their pets
- Newsletters and mailings
- Ads in newspapers, radio, TV
- Education at field days & community events
- Distribute education materials to Vets / Pounds / Shelters
- Work with septic system installers to distribute information to homeowners

Tracking Achievements

- *Tracking of Ag implementation:* by DCR and SWCD
- *Tracking of Res implementation:* by local VDH
- *Tracking of water quality improvements:* DEQ conducts water monitoring
- Monitoring and implementation data should be correlated
- Citizen monitoring
- Online Forum – Chesapeake Network (courtesy of ACB)


DEQ - Post Implementation Planning Monitoring Stations
GOOCHLAND
POWHATAN
CHESTERFIELD
HANOVER
RICHMOND
HENRICO
CHARLES CITY
HOPEWELL
2-TKO004.69
2-JMS117.35
2-BOR001.73
2-JMS115.29
2-JMS111.17
2-PWT000.57
2-GIL000.42
2-JMS112.79
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DEQ Post-IP Monitoring
County Boundary
Almond Creek
Bernards Creek
Falling Creek
Gillie Creek
Goode Creek
James River
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No Name Creek
Powhite Creek
Reedy Creek
Tuckahoe Creek
James Tidal Impairment
James River
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What's Next?

- 30 day comment period ends 6/20/2011
  - Send comments to Margaret Smigo, DEQ
- Plan approval by the State Water Control Board
- Soil and Water Conservation Districts will continue providing technical assistance for Ag BMPs
- Stakeholders can utilize approved draft in their local planning efforts or to apply for grant funding
- Stakeholders can be post implementation efforts on "Forum" site (coming soon)

How Can You Help?

- Dispose of Pet Waste Properly
- Maintain your Septic System
- Join a Local Watershed Group – Volunteer!
- Plant native trees and shrubs in the riparian corridor and minimize runoff from your property
- Do not feed wildlife
- Be a citizen water quality monitor (contact DEQ or local watershed group)
- Contribute info regarding Implementation progress on "Forum" (coming soon)

Send Comments To:

Mail: Margaret Smigo
Piedmont TMDL Coordinator
Department of Environmental Quality
4949-A Cox Road Glen Allen VA 23060
Email: Margaret.Smigo@deq.virginia.gov
Fax: (804)-527-5106 w/ Attn: Margaret Smigo

The plan can be found at the following web address:

http://www.deq.state.va.us/tmdl/iprpts.html

Questions? Call Margaret at: (804) 527-5124

Extra Information

Reedy Creek Remodeling - Reasoning

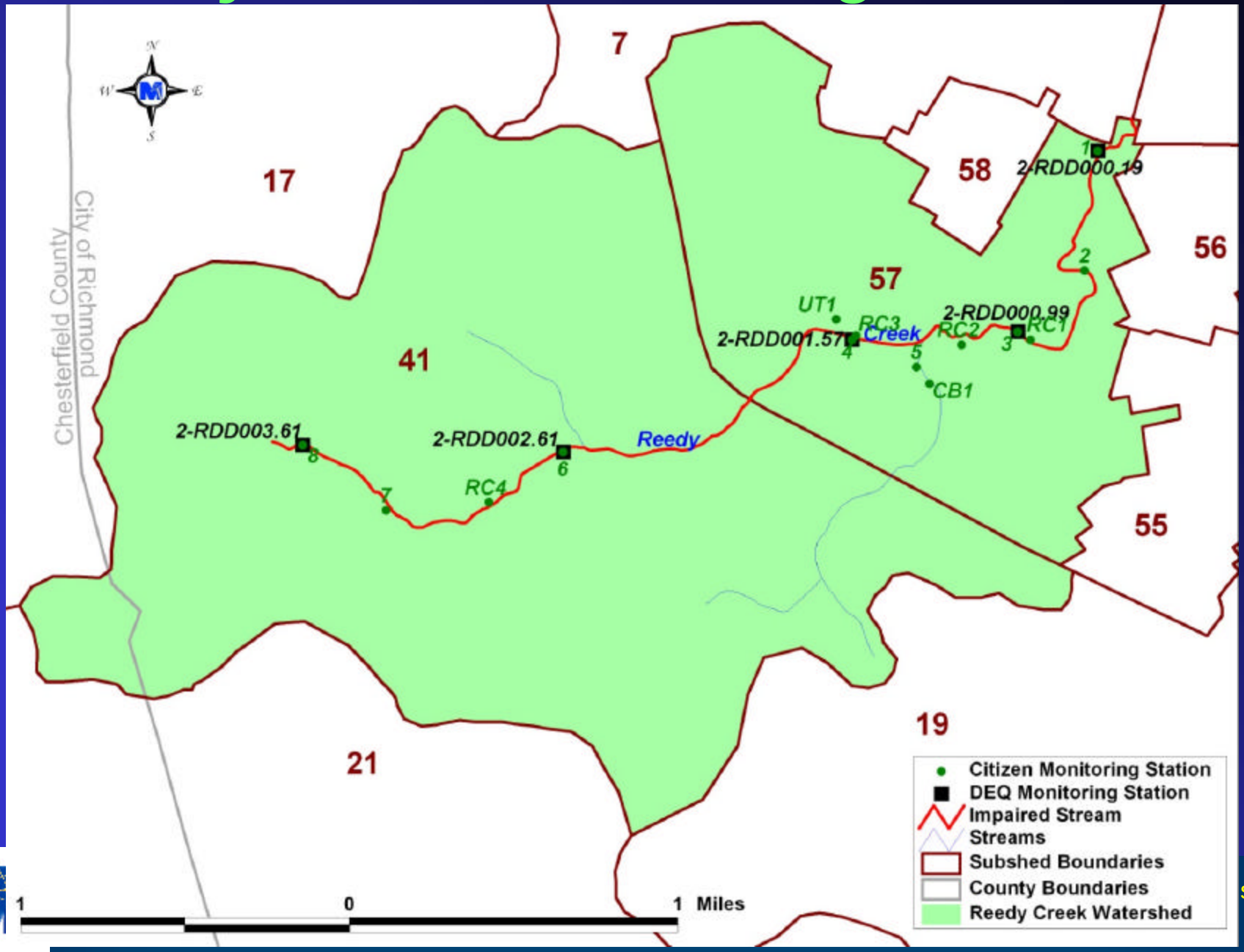
- More bacteria data collected during and after TMDL development
- Concentrations were overall higher than original data
- This situation led to the need to recalibrate then reallocate the Reedy Creek model

Reedy Creek Remodeling – Inclusion of more Recent Data

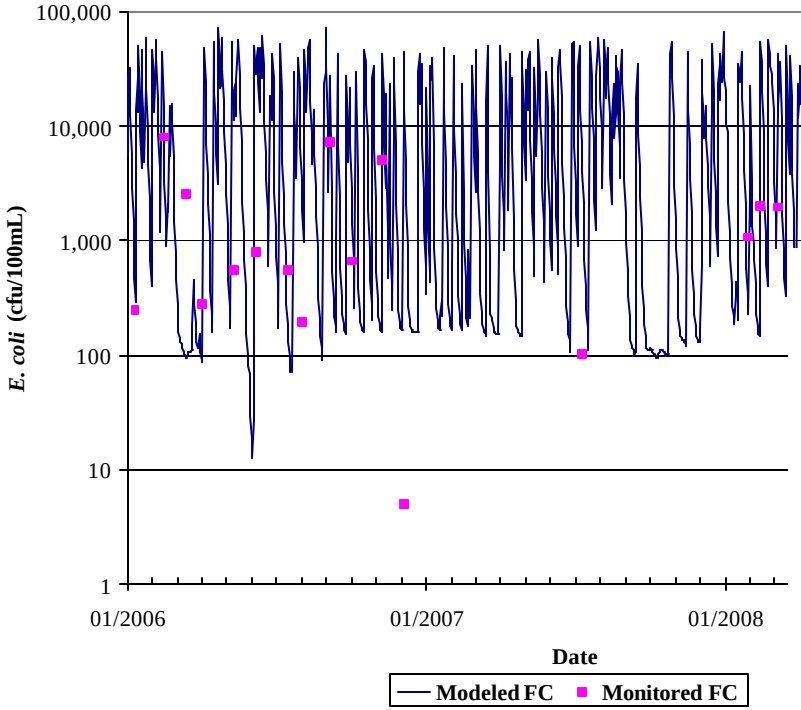
Station	Sampler	Start Date	End Date	#	Min	Max	Mean	Median	Std Dev	Violation %
1	Citizen	6/28/2003	6/4/2005	21	5	11,460	1,053	75	2,682	24%
2-RDD000.19	DEQ	7/2/2003	6/12/2007	32	20	2,100	313	87	554	28%
2	Citizen	6/28/2003	6/4/2005	21	5	9,540	840	180	2,109	33%
RC1	Citizen	2/20/2010	10/16/2010	9	82	2,420	1,186	579	1,040	78%
2-RDD000.99	DEQ	1/10/2006	12/5/2006	12	27	7,200	1,018	115	2,097	42%
3	Citizen	6/28/2003	6/4/2005	21	5	13,340	1,461	240	3,076	52%
2-RDD001.57	DEQ	1/10/2006	12/16/2008	25	5	9,000	2,008	1,960	2,138	88%
4	Citizen	6/28/2003	3/19/2005	18	5	13,980	950	45	3,268	22%
RC3	Citizen	2/20/2010	10/16/2010	9	166	2,420	1,478	1,300	857	89%
2-RDD002.61	DEQ	1/10/2006	12/5/2006	11	13	9,000	1,074	170	2,658	45%
6	Citizen	6/28/2003	6/4/2005	21	5	14,000	1,230	90	3,230	33%
RC4	Citizen	2/20/2010	10/16/2010	9	48	2,420	510	199	771	44%
7	Citizen	6/28/2003	6/4/2005	21	5	4,400	506	60	1,035	33%
2-RDD003.61	DEQ	1/10/2006	12/5/2006	11	28	6,900	943	170	2,022	45%
8	Citizen	6/28/2003	6/4/2005	21	25	7,760	1,245	400	2,124	57%
CB1	Citizen	2/20/2010	10/16/2010	9	20	2,420	1,529	2,420	1,118	67%
5	Citizen	6/28/2003	3/19/2005	19	5	27,000	3,664	1,030	6,457	63%

*using the Single Sample standard (235 cfu/100mL)

Reedy Creek Remodeling - Stations



Reedy Creek Remodeling – Recalibration



2-RDD001.57 (sub 41) from 2006 - 2008

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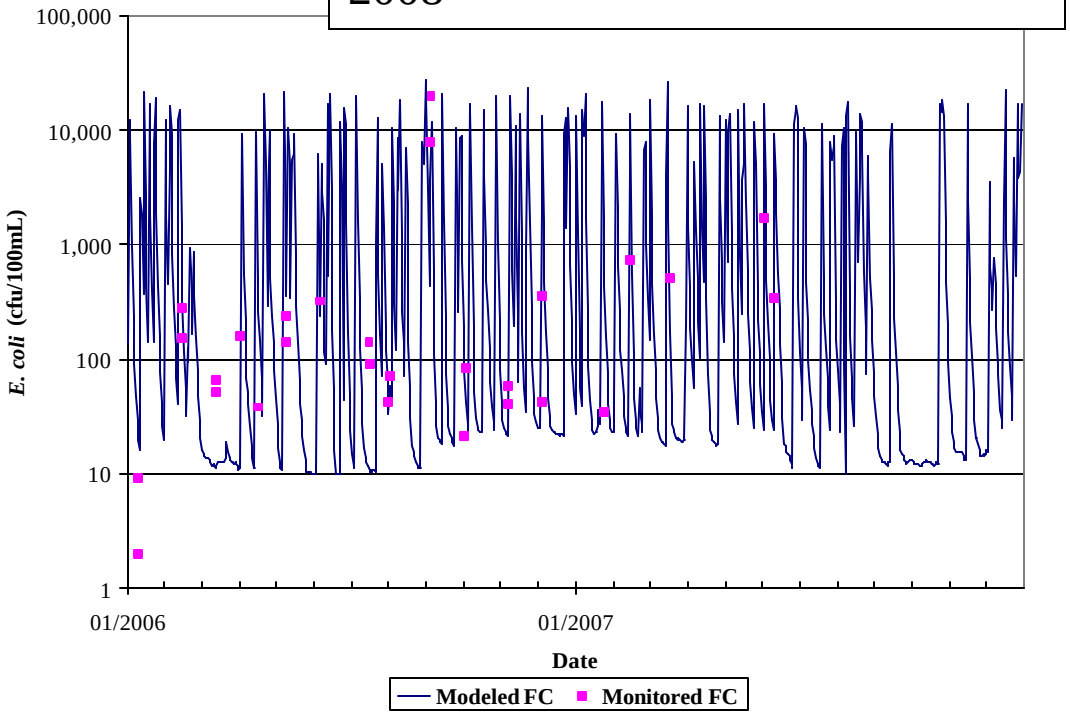

Vegetated Roofs

- Intercepts water that would otherwise end up in sewers
- Reduces stormwater peak flow by detention
- Reduces stormwater volume by utilizing water for plant growth
- 63,677 sq. ft of Vegetated Roofs already installed!

Bioretention Basins

- Collects parking lot run-off
- Reduces stormwater peak flow by detention
- Reduces stormwater volume by infiltration
- Water quality benefits
- 46,060 sq. ft. of Bioretention Facilities already installed!
- 92,753 sq. ft of Rain Gardens/Bayscapes already installed!

Rainwater Harvesting: Rain Barrels and Cisterns

- Catches stormwater
- Utilize water for irrigation or grey water
- Keep stormwater out of sewers
- 3 Rainwater Harvesting systems already installed collecting 27,070 gallons!

Permeable Pavement

5th St. Green Alley Surface (completed in August 2010) between 4th / 5th Streets & E. Main / E. Cary Streets

- Reduce run-off by infiltration
- Keeps stormwater out of sewers
- 177,306 sq. ft. of Permeable Pavement already installed!

Urban Stormwater Volume Reduction BMPs

- The Long Term Control Plan (LTCP) for the City of Richmond is the guiding document for CSO management
- Reductions in CSO bacteria loads will be necessary to meet water quality standards in the James River (riverine), James River (tidal), Gillie Creek and Almond Creek.
  - The LTCP Alternative E is sufficient to meet WQS in James River (riverine) and James River (tidal)
  - Further bacteria reductions beyond the LTCP option "Alternative E" for Gillie and Almond CSOs watersheds are needed based on the findings of the TMDL

Urban Stormwater Volume Reduction BMPs

- COR estimated Gillie Creek CSO needs 29.2 MG more storage to meet the TMDL
- COR estimated Almond Creek CSO needs 2 MG more storage to meet the TMDL
- Urban Low Impact Development (LID) practices offer a potential supplement to traditional CSO mitigation measures
  - Estimated maximum implementation of LID practices would get:
    - 3.5MG reduction in runoff in Gillie Creek CSO watershed
    - 0.4MG reduction in runoff in Almond Creek CSO watershed